Two New Species of *Candacia* (Copepoda: Calanoida) from the Central Pacific, with Notes on Two Other Species[1]

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DURING EXAMINATION of plankton samples collected from the central Pacific Ocean by the Honolulu Biological Laboratory (formerly Pacific Oceanic Fishery Investigations) of the U. S. Fish and Wildlife Service, two species of *Candacia* were found which appear to be undescribed. In addition to describing these two species we present evidence that *Candacia turgida* Wilson is a synonym of *C. truncata* (Dana). We also include a description and figures of *Candacia norvegica* (Boeck), a species apparently rare in the Pacific Ocean.

We wish to acknowledge the help of Dr. Thomas E. Bowman in loaning us type material from the U. S. National Museum, and that of Dr. Paul L. Illg for valuable suggestions during the preparation of the type material and the manuscript.

Candacia pofi new species
Figs. 1–21

LOCALITY AND MATERIALS: 1° 23′ S., 112° 46′ W. (U. S. Fish and Wildlife Service "Hugh M. Smith" cruise 31, station 75-3, Oct. 31, 1955, 200–140 m. depth of tow; 23 females and 6 males). Physical, oceanographic, and other data from this cruise have been published by King, Austin, and Doty (1957).

Type material of *Candacia pofi* has been deposited in the U. S. National Museum as follows: Female holotype (USNM 102730), male allotype (USNM 102731), 22 female paratypes and 5 male paratypes (USNM 102732).

MEASUREMENTS: Measurements were made from a dorsal view along a sagittal plane. The abdomen was supported by a plastic strip to reduce flexion. The copepod, stained with methyl blue and immersed in lactic acid, was mounted under a cover slip supported by plastic strips to avoid distortion due to pressure or a meniscus. The total length was measured from the anterior margin of the head to the ends of the caudal furca. The abdomen was measured from the anterior margin of the genital segment to the ends of the caudal furca. These measurements excluded the telescoped portions of the abdominal segments. The ratios of the lengths of the abdominal segments, however, include the telescoped portions as indicated by dotted lines in the figures. Pertinent measurements and ratios of the cephalothorax and abdomen of the holotype, allotype, 3 female paratypes, and 4 male paratypes are given in Table 1.

DESCRIPTION: In the adult female the cephalothorax (Fig. 1) is slender, being widest at the first thoracic segment. The posterior lateral angles of the thorax are produced into sharp symmetrical processes which reach to a line including 60 per cent of the length of the genital segment (Fig. 3). The genital segment (Fig. 3) is symmetrical in dorsal view, longer than wide and without lateral swellings or processes. The genital pore is situated on a very large protuberance which extends ventrad and caudad. In lateral view (Figs. 2, 4), the posterior margin of this protuberance is approximately continuous with the posterior margin of the genital segment. In ventral view (Fig. 5), the genital protuberance is round with a slight lip at the posterior margin. In the holotype, this lip is slightly asymmetrical. The second abdominal segment (Fig. 3) is asymmetrical in dorsal view, the right margin being convex and the left margin straight. The ventral surface is wrinkled and bears a low process which extends to the left as a lobe with a more or less crenulate margin.

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The dorsal surface of the anal segment (Fig. 3) bears a very prominent, broad bifurcate process pointing caudad. The posterior lateral surface of each of the diverging tubercles of this process has a patch of very fine teeth visible under 100× magnification. In the holotype, these tubercles appear to be slightly asymmetrical in size and in details of minute swellings and creases. Examination of paratype material indicates that there is variation in these details and also in the ventral lobe of the second abdominal segment.

The furcal rami (Fig. 3) are longer than wide. The outermost furcal setae are thick and originate high on the lateral margins of the rami. There is a small tooth dorsad of the origin of the middle major seta of each ramus.

The proximal seven segments of the first antennae are thickened. The first segment has three small spines, and segments 2 through 6 have small marginal spines (Fig. 6). It is probable that additional segments had spines which have been lost in the material at hand.

The second antennae are similar to those of other members of the genus. The exopod has six setae plus a minute one; the second endopodal segment is divided into two lobes, the external with six setae plus a minute one and the internal with five setae plus a minute one.

The exopod of the mandibular palpus has five setae; the endopod has six. The mandibular blades (Fig. 7) are composed of a large point and a basal tooth with three points decreasing in length mediad.

The first maxillae are best described by reference to Figure 8.

The second maxillae (Fig. 9) are large and have the form of maxillipeds. The basal segment is composed of four lobes. There is a single long seta on the first lobe with a minute seta at its base, two small setae on the internal margin of the second lobe, and one large spine with a short spine at its base on each of the third and fourth lobes. There are two long spines of about equal length on the second basipodal segment, and the proximal one has a minute spine at its base. Distad of the second basipodal segment are three very long, curved spines, the middle of which is the longest. Three very small bristles arise from the base of the distal spine.

The maxillipeds are reduced in length (Fig. 10). The first segment is about as long as the remaining segments combined and is 1.7 times the length of the second. There is a tubercle on the internal margin of the first segment near the proximal end and a single long seta just distad of the midpoint of that margin. Two slender setae, one twice the length of the other, arise from the junction of the first and second segments. At about the midpoint of the internal margin of the second segment, there is a patch of hair proximad of three setae. The distal end of this segment appears to receive the proximal end of the third so that the second and third each have three setae. Vervoort (1957), in describing *C. maxima,* attributes four setae to the second segment and two to the third. Giesbrecht (1892, pl. 21, figs. 26, 27) indicates that in *C. longimana* Claus the fourth seta is between the two segments but in *C. bispinosa* Claus it is on the third segment. This appendage is usually regarded as having little diagnostic value, but the origin of the fourth seta might add a distinguishing character. The fourth, fifth, and sixth segments have a pair of setae, the distal one in each pair being longer. Distad of the sixth segment are two long setae of almost equal length.

The lengths of the third exopodal segments of swimming feet 1 to 4 (Figs. 11–14) have the following relation to that of their respective terminal spines: 1:1, 2:1, 3:1, and 3:2.

The symmetrical fifth feet (Fig. 15) are long and slender, each ending in two sharp, smooth terminal fingers. The inner finger is about four times the length of the outer finger. There are two external spinous processes located at points about one-fourth and two-thirds of the segment length from the proximal end of the distal segment. There are no internal spines or setae. The penultimate segment bears a single seta, and the ratio of the length of that segment to that of the distal segment is 1:4.6.

Brown pigmentation in the female is restricted to the following structures: the fifteenth segment of the first antennae, the setae of the second antennae and the mandibular palpi, the second segment of the second max-

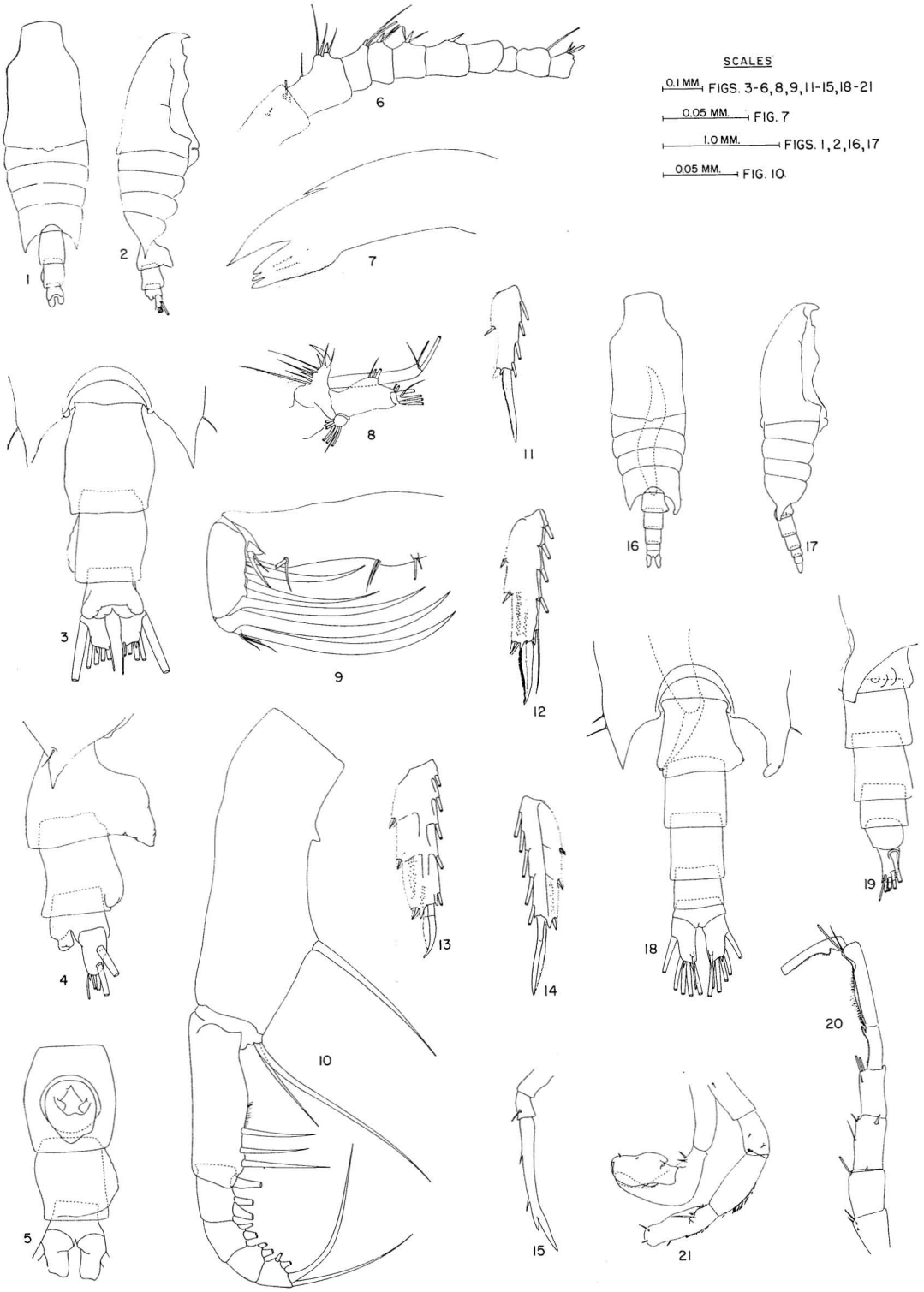
SCALES
0.1 MM. FIGS. 3-6,8,9,11-15,18-21
0.05 MM. FIG. 7
1.0 MM. FIGS. 1,2,16,17
0.05 MM. FIG. 10.
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TABLE 1
TOTAL LENGTHS, CEPHALOTHORAX–ABDOMEN RATIOS, AND ABDOMINAL SEGMENT RATIOS OF *Candacia pofi*

SPECIMENS	TOTAL LENGTH (mm.)	CEPHALOTHORAX–ABDOMEN RATIO	RELATIVE LENGTH OF ABDOMINAL SEGMENTS					
			1	2	3	4	5	Furca
Females								
Holotype	2.30	2.75:1	38	32	16	...	...	14 = 100
Paratype	2.41	2.64:1	42	30	16	...	...	12 = 100
Paratype	2.41	2.55:1	41	32	16	...	...	11 = 100
Paratype	2.36	2.75:1	39	29	17	...	...	15 = 100
Males								
Allotype	2.28	2.52:1	21	21	21	14	9	14 = 100
Paratype	2.21	2.61:1	21	21	21	14	9	14 = 100
Paratype	2.24	2.38:1	21	21	21	14	9	14 = 100
Paratype	2.23	2.54:1	...	...	...	...	...	... ...
Paratype	2.21	2.43:1	...	...	...	...	...	... ...

illae, the third exopodal segments of swimming feet 1 to 4, and the furcal setae.

The pertinent measurements and ratios of the adult males are presented in Table 1. The posterior lateral angles of the male cephalothorax (Fig. 16) are produced into asymmetrical processes. The left is sharp and reaches to the posterior margin of the genital segment. The right process (Fig. 18) is thick and slightly curved inward and reaches to a line including one-quarter of the length of the second abdominal segment. In lateral view (Figs. 17, 19), this right process is thick and truncate with a convex dorsal margin and a concave ventral margin.

The male genital segment (Fig. 18) is asymmetrical with a rounded swelling tipped with a small button on the right side. In lateral view (Fig. 19) the swelling appears as two or three concentric, incomplete circles. The left posterior margin of the genital segment is broken by the genital opening. In the allotype, a canal is visible from the genital opening to a spermatophore (Fig. 18).

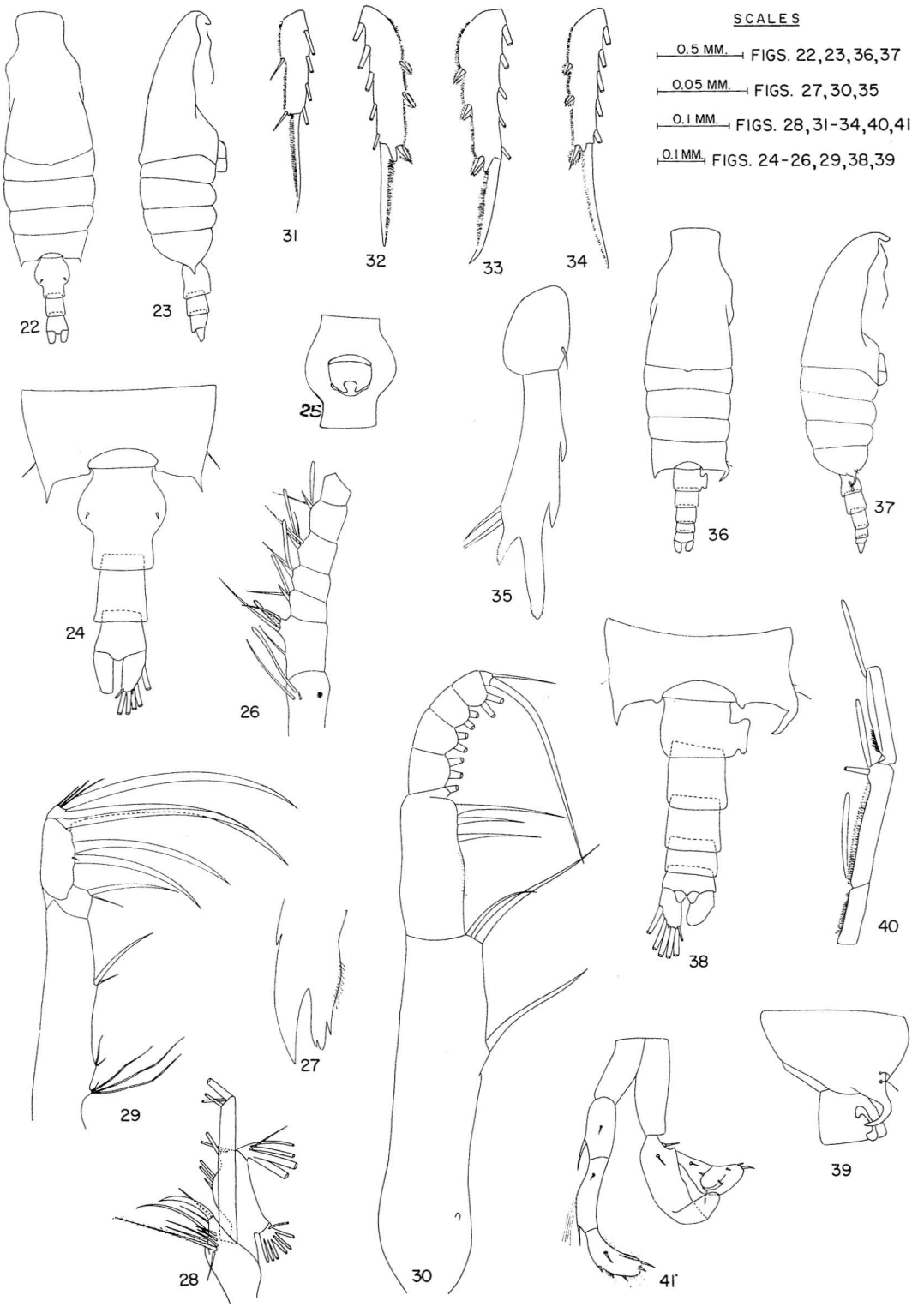
The geniculate right antenna (Fig. 20) is armed with coarse, unequal pigmented teeth on segment 18, fine pectination on segment 17 extending onto the anterior margin of a distal spinous process, and very fine pectination on segment 19. Segments 17, 18, 19, and 20 are separate.

The right fifth foot (Fig. 21) is chelate with the tip of the distal segment reaching slightly beyond that of the penultimate segment. The terminal spine is turned flat against the surface of the distal segment. The left fifth foot is broad and ends in a spatulate segment (Fig. 21).

Pigmentation is similar to that of the female. In addition, the geniculate portions of the right first antenna are heavily pigmented. There is no pigmentation on the right thoracic process or the genital segment.

REMARKS: The female of *C. pofi* resembles *C. cheirura* Cleve (as described by Farran, 1929) in having ventral protuberances on the genital and second abdominal segments, and thick ex-

FIGS. 1–21. *Candacia pofi* n. sp. 1, female, dorsal view; 2, female, lateral view; 3, fourth and fifth thoracic segments and abdomen, dorsal view, female; 4, fourth and fifth thoracic segments and abdomen, lateral view, female; 5, abdomen, ventral view, female; 6, proximal 10 segments of first antenna, female; 7, mandibular blade, female; 8, first maxilla, female; 9, second maxilla, female; 10, maxilliped, female; 11, third exopodal segment of first foot, female; 12, third exopodal segment of second foot, female; 13, third exopodal segment of third foot, female; 14, third exopodal segment of fourth foot, female; 15, fifth foot, female; 16, male, dorsal view; 17, male, lateral view; 18, fourth and fifth thoracic segments and abdomen, dorsal view, male; 19, fourth and fifth thoracic segments and abdomen, lateral view, male; 20, segments 13 through 19, right first antenna, male; 21, fifth feet, male. Figures 1–12 and 15 drawn from holotype; Figures 13 and 14 from paratype. Figures 16–19 and 21 drawn from allotype; Figure 20 from paratype.


SCALES
0.5 MM. FIGS. 22,23,36,37
0.05 MM. FIGS. 27,30,35
0.1 MM. FIGS. 28,31-34,40,41
0.1 MM. FIGS. 24-26,29,38,39
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ternal furcal setae. It can be distinguished from *C. cheirura* by the asymmetry of the abdomen in dorsal view and by the presence of dorsal tubercles on the anal segment. The female resembles *C. armata* Boeck (as described by G. O. Sars, 1903) in having an asymmetrical second abdominal segment. It can be distinguished from this species by the extremely large genital protuberance, the ventral lobe of the second abdominal segment extending to the left rather than to the right, the dorsal tubercles on the anal segment, and details of the fifth feet.

The geniculate antenna of the male *C. pofi* resembles that of *C. armata* Boeck (as described by Sars, 1903), *C. bradyi* and *C. discaudata* A. Scott, *C. bipinnata* Giesbrecht, and *C. cheirura* Cleve in having segments 17, 18, 19, and 20 separate and in having coarse, unequal pigmented teeth on segment 18. *C. pofi* can be distinguished from *C. bradyi* and *C. discaudata* by the produced right thoracic process. It can be distinguished from *C. armata, C. bipinnata,* and *C. cheirura* by the low, rounded genital process in lieu of the sharp spinous process in those species. The name of this species is derived from Pacific Oceanic Fishery Investigations.

Candacia guggenheimi new species
Figs. 22–41

LOCALITIES AND MATERIALS: 26° 25.2′ N., 155° 03.0′ W. (U. S. Fish and Wildlife Service "Hugh M. Smith" cruise 25, sta. 33, Feb. 10, 1954, 200–0 m. depth of tow, 2 females, 4 males); 32° 33′ N., 148° 51.5′ W. ("Hugh M. Smith" cruise 25, sta. 53, Feb. 22, 1954, 200–0 m. depth of tow, 1 male); 23° 56′ N., 157° 31′ W. ("Hugh M. Smith" cruise 30, sta. 112-1, Aug. 27, 1955, 140–0 m. depth of tow, 1 female); 21° 55′ N., 158° 08′ W. ("Hugh M. Smith" cruise 32, sta. 26, Feb. 5, 1956, 200–140 m. depth of tow, 1 female, 1 male); 0° 00′, 149° 38′ W. ("Hugh M. Smith" cruise 47, sta. 29, Oct. 27, 1958, 500 m. depth of tow, 1 female). This species has also been observed in samples collected at the following stations on "Hugh M. Smith" cruise 25 (all 200–0 m. collections): 21° 36.5′ N., 159° 00′ W. (sta. 2, Jan. 16, 1954); 33° 55.7′ N., 164° 58.5′ W. (sta. 11, Jan. 22, 1954); 26° 31′ N., 160° 00′ W. (sta. 26, Jan. 30, 1954); 22° 03.7′ N., 158° 40′ W. (sta. 29, Feb. 1, 1954); 29° 32′ N., 155° 04.8′ W. (sta. 35, Feb. 12, 1954); 32° 30′ N., 154° 59′ W. (sta. 37, Feb. 13, 1954). Physical, oceanographic, and other data for cruise 25 have been summarized by McGary and Stroup (1956) and that for cruise 30 by McGary, Jones, and Austin (1956).

Type material of *C. guggenheimi* has been deposited in the U. S. National Museum. A female from cruise 25, sta. 33, was selected as the holotype (USNM 102733). A male from this station was designated the allotype (USNM 102734). Paratypes are as follows: 1 female, 3 males, cruise 25, sta. 33 (USNM 102735); 1 male, cruise 25, sta. 53 (USNM 102736); 1 female, cruise 30, sta. 112-1 (USNM 102737); 1 female, 1 male, cruise 32, sta. 26 (USNM 102738); 1 female, cruise 47, sta. 29 (USNM 102739).

MEASUREMENTS: All measurements were made in the method described for the preceding species. The total length of five adult females ranges from 1.94 to 2.06 mm. The lengths and cephalothorax–abdomen ratios, based on three of these individuals are: holotype 2.01 mm., 2.9:1; paratypes 1.96 mm., 2.8:1; 2.04 mm., 3.1:1.

The total length of six adult males varies from 1.90 to 2.00 mm. These lengths and the

FIGS. 22–41. *Candacia guggenheimi* n. sp. 22, female, dorsal view; 23, female, lateral view; 24, fourth and fifth thoracic segments and abdomen, dorsal view, female; 25, genital segment, ventral view, female; 26, proximal seven segments of first antenna, female; 27, mandibular blade, female; 28, first maxilla, female; 29, second maxilla, female; 30, maxilliped, female; 31, third exopodal segment of first foot, female; 32, third exopodal segment of second foot, female; 33, third exopodal segment of third foot, female; 34, third exopodal segment of fourth foot, female; 35, fifth foot, female; 36, male, dorsal view; 37, male, lateral view; 38, fourth and fifth thoracic segments and abdomen, dorsal view, male; 39, fourth and fifth thoracic segments and genital segment, lateral view, male; 40, segments 17 through 19, right first antenna, male; 41, fifth feet, male. Figures 22, 23, 27, and 34 drawn from paratype; Figures 24–26, 28–33, and 35 drawn from holotype. Figures 36–39 and 41 drawn from allotype; Figure 40 drawn from paratype.

cephalothorax–abdomen ratios, based on four of these, are: allotype 1.90 mm., 2.91:1; paratypes 1.92 mm., 2.9:1; 1.94 mm., 2.7:1; 2.00 mm., 2.7:1.

DESCRIPTION: The general shape of the adult female is similar to other species of the genus *Candacia.* The head is truncate in dorsal view; thoracic segments 4 and 5 are fused and produced posteriorly into two symmetrical points (Fig. 22). In lateral view (Fig. 23), a small hump is visible on the dorsal surface at the junction of the head and first thoracic segment.

The genital segment is slightly asymmetrical; the lateral swelling on the left side is smaller and somewhat more expanded than that on the right side (Figs. 24, 25). A single dorsal spine is present on each swelling. The abdominal segments and furca have the following proportions (based on holotype): 40, 26, 19, 15 = 100.

The first antennae, when held against the body, reach to about the tips of the furcal rami. The proximal part of the antenna is thickened and consists of seven segments (Fig. 26). Segments 1 through 6 and 8 through 12 have one spine. There are indications that additional segments are furnished with a spine but no perfect antennae were present among the specimens examined.

The second antennae are similar to those of other species of *Candacia.* Basipodal segments 1 and 2 have one seta. Segment 2 of the endopod ends in two lobes. The outer lobe has six large and one small setae. The inner lobe has five large and one small setae and one minute seta proximad of the small one.

The exopod of the mandible apparently consists of four segments, the first three of which are furnished with a single seta. The terminal segment has two setae. The endopod is composed of one segment which is provided with six setae. The basal tooth of the mandible is furnished with two subequal points and a marginal point (Fig. 27).

The first maxillae are best described by reference to Figure 28.

The second maxillae are of large size (Fig. 29). The basal segment has four lobes. There are three long and one very short setae on the first lobe, one long and one short seta on the second lobe, one long and one short spine on the third lobe, and one long and one short spine on the fourth lobe. The second basipod segment has two subequal spines, the proximal one has a minute spine at its base. The endopod is furnished with three spines, the middle of which is slightly longest. In addition there are three bristles on the terminal part of the endopod.

The maxillipeds (Fig. 30) are small. The first basal segment is more than twice as long as the second basal segment. The former has one seta at a point about two-thirds of the segment length from the proximal end and two setae on the distolateral corner. The second basal segment is furnished with three unequal setae and one other seta on the apparent apex. Hair is present on the internal margin of this segment. The five endopodal segments are each furnished with one long and one short seta. The long seta on the terminal segment is somewhat longer than those on the other endopodal segments.

The third exopodal segments of swimming feet 1 to 4 are shown in Figures 31–34. The relative lengths of these segments to their respective terminal spines are as follows (based on several specimens): 1:1, 1:0.8 (estimate), 1:0.6, and 1:1.

The fifth feet are symmetrical and each terminates in one long stout finger and one short spinous process (Fig. 35). The former is about three times longer than the latter. The finger has several rounded serrations distally, and the spinous process is finely serrate. The external margin of the segment has two spinous processes. The internal margin bears two subequal setae in all observed specimens except one ("Hugh M. Smith" cruise 47, sta. 29-1) which has three internal setae on one foot.

The following appendages of the preserved holotype are pigmented: the distal 18 segments of the first antennae, the distal spinelike claw on the first inner lobe of the first maxillae, portions of the first basipod segment and the distal five spines of the second maxillae, basipodal segments 1 and 2 of the first four pairs of swimming feet, and the terminal finger and spinous process of the fifth pair of feet. The female collected on "Hugh M. Smith" cruise 47, sta. 29, has additional pigmentation as follows: the distal 20 segments of first antennae, the spines

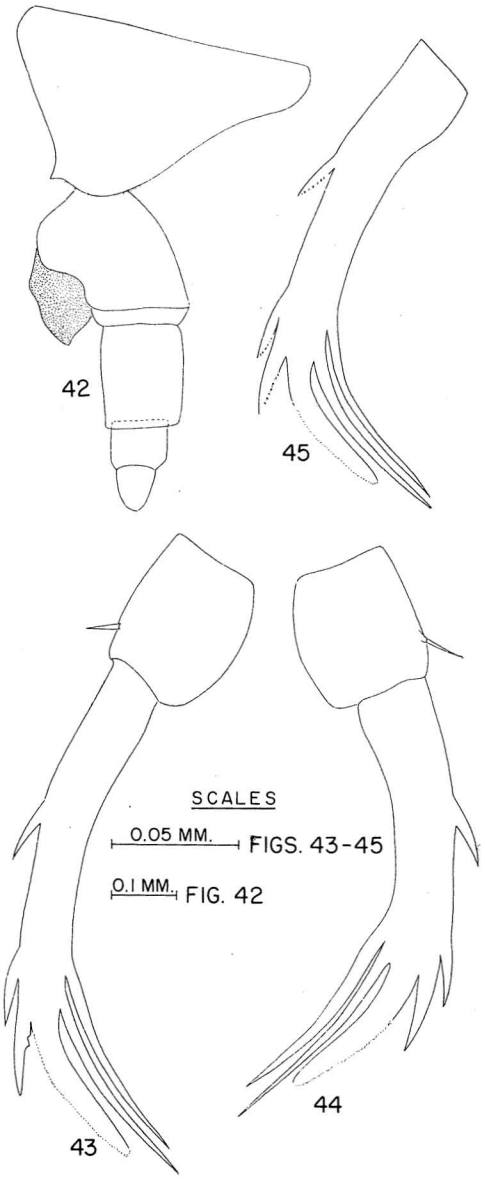
on lobes 3 and 4 of the second maxillae, much of both rami of swimming feet 1 to 4 including several setae on the second and third exopodal segments and second endopodal segment, and the first basipodal segment of the fifth pair of feet.

The adult male (Figs. 36, 37) is slightly smaller than the female. The right posterior lateral process of the fifth thoracic segment is produced posteriorly and curved inward in dorsal view (Fig. 38). It reaches to the middle of the protrusion on the genital segment. In lateral view, the thoracic process has a decided upward bend (Fig. 39). The genital segment has a bilobed protrusion arising from near the posterior end of the right margin (Fig. 38). The abdominal segments and furca have the following ratios (based on three specimens): 22, 24, 20, 13, 9, 12 = 100.

Segments 17, 18, 19, and 20 of the right first antenna (Fig. 40) are separate, with 17, 18, and 19 toothed. The nearly uniform teeth on segment 18 are coarser than those on segments 17 and 19. The fifth feet are shown in Figure 41.

The following body parts and appendages of the male are pigmented (based on examination of several specimens): segments 17 to 25 of the right antenna, the distal 17 segments of the left antenna, the process on the right corner of the fifth thoracic segment, the clawlike spine on the distal part of the first inner lobe of the first maxillae, portions of the first basipod and spines on lobes 3 and 4 and the five large distal spines of the second maxillae, basipodal segments 1 and 2 of swimming feet 1 to 4.

REMARKS: The female of *C. guggenheimi* superficially resembles *C. longimana* Claus. The spines on the dorsal surface of the genital segment, the structure of the fifth pair of feet, and the somewhat smaller size of this species readily distinguish it from *C. longimana.* The bilobed protrusion on the genital segment and the structure of the fifth feet serve to distinguish the male. This species is named for the late Simon Guggenheim, one of the founders of the John Simon Guggenheim Memorial Foundation.



FIGS. 42–45. *Candacia truncata* (Dana). 42, fourth and fifth thoracic segments and abdomen, left lateral view, female, showing cement mass attached to genital segment; 43, 44, unlike fifth feet, female, from same specimen; 45, fifth foot, female, with serrated external spinous processes, from another specimen.

NOTES ON TWO OTHER SPECIES

Candacia truncata (Dana)
Figs. 42–45

Candace truncata Dana, 1849, Proc. Amer. Acad. Arts Sci., 2: 24.
Candacia truncata Giesbrecht and Schmeil, 1898, Das Tierreich, 6, p. 130; auct.
Candacia turgida Wilson, 1950, U. S. Natl. Mus. Bul. 100, 14(4): 183–184. New synonomy.

In the course of examining plankton samples we have encountered numerous individuals of a species which appears to agree with the description of *C. turgida* Wilson (1950). We believe, however, that these specimens, as well as *C. turgida,* are identical with *C. truncata* (Dana).

The pigmented process on the ventral side of the female genital segment (shaded portion of Fig. 42), which Wilson considered to be a protrusion of that segment, appears to be a mass of cement associated with a spermatophore. In most of the samples examined there were some females with this mass and others without. Furthermore, the mass can be removed quite easily with a needle. Tanaka (1935) presented a figure of a female *C. truncata* showing such a mass adhering to the genital segment.

Wilson's figure of the female fifth feet (1950: pl. 22, fig. 308) of his *C. turgida* apparently is not complete in detail. Dr. Thomas E. Bowman has kindly sent us a sketch of the fifth feet from one of the syntypes of this species. His sketch and the numerous fifth feet examined from our material agree in the structure of the large terminal finger. The external margin of this finger in all specimens examined and in Dr. Bowman's sketch is finely serrate along most of its length. The distolateral and two external spinous processes are, however, somewhat variable. In some specimens the distolateral spinous process has one or two relatively large teeth on the internal margin as figured by Giesbrecht (1892). One has a single external tooth opposite two internal ones; another has seven small internal teeth. In some specimens the feet are asymmetrical, being unequal in length and with unlike dentition on the distolateral spinous process. One specimen has four teeth on one foot and two on the other. In yet another, this process is toothed on one foot and smooth on the other. Figures 43–45 show some of the variations of the fifth feet of the female *C. truncata* from the central Pacific. Typical males of *C. truncata* have also been observed in our collections. Specimens of this species were obtained in the following localities: 22° 03.7′ N., 158° 40′ W. ("Hugh M. Smith" cruise 25, sta. 29, Feb. 1, 1954, 200–0 m. depth of tow); 0° 00′, 149° 36′ W. ("Hugh M. Smith" cruise 47, sta. 30, Oct. 27, 1958, surface collection). Seven females from 23° 55′ N., 157° 31′ W. ("Hugh M. Smith" cruise 30, sta. 112-2, Aug. 27, 1955, 49 m. depth of tow) have been deposited in the U. S. National Museum (USNM 102740).

Candacia norvegica (Boeck)
Figs. 46–65

The distribution of *Candacia norvegica* (Boeck) in the North Atlantic has been summarized by Farran (1948). Sewell (1932) described a variety *tropica* from the Indian Ocean. In his reports on the Carnegie and Albatross collections, Wilson (1942, 1950) recorded *C. norvegica* from many stations in the tropical and temperate Pacific Ocean. In a

FIGS. 46–65. *Candacia norvegica* (Boeck). Figures 46–62 refer to Pacific specimens; Figures 63–65 to Atlantic specimen. 46, female, lateral view; 47, abdomen, dorsal view, female; 48, lateral view of left genital spinous process; 49, lateral view of right genital spinous process; 50, 51, mandibular blades from one individual female, showing unlike basal teeth; 52, first maxilla, female; 53, second maxilla, female; 54, fifth feet, female, with two external spinous processes on each foot; 55, fifth feet, female showing three external spinous processes on one foot and two on the other; 56, male, dorsal view; 57, male, lateral view; 58, fourth and fifth thoracic segments and abdomen, dorsal view, male; 59, genital segment, ventral view, male; 60, fourth and fifth thoracic segments and genital segment, right lateral oblique view, male; 61, segments 17 through 19, right first antenna, male; 62, fifth feet, male; 63, abdomen, dorsal view, female; 64, left genital spinous process; 65, right genital spinous process. Figures 47–49 and 54 are from Pacific female 2.96 mm. total length; all others of Pacific female are from specimen 2.80 mm. total length.

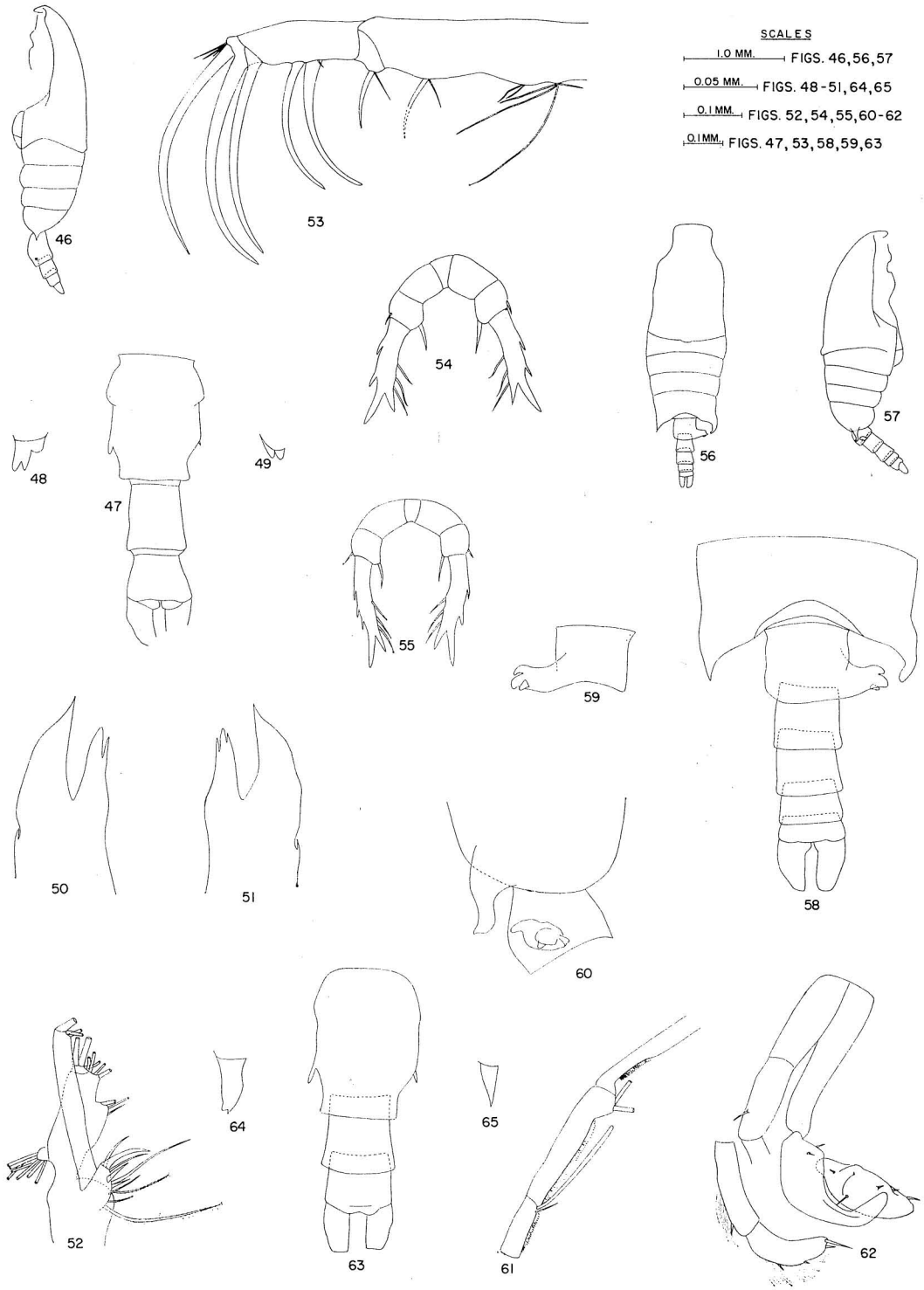

SCALES
1.0 MM. FIGS. 46,56,57
0.05 MM. FIGS. 48-51,64,65
0.1 MM. FIGS. 52,54,55,60-62
0.1MM. FIGS. 47, 53, 58,59,63
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TABLE 2
COMPARISON OF FEMALE *Candacia norvegica* FROM GEORGES BANK, THE PACIFIC, AND VARIETY *tropica*

SOURCE	TOTAL LENGTH* (mm.)	CEPHALOTHORAX–ABDOMEN RATIO*	ABDOMEN RATIO = 100 SEGMENT NUMBER			
			1	2	3	Furca
Georges Bank (USNM)	3.24	2.89:1	45	24	18	13
Pacific	2.96	2.66:1	45	24	17	14
Pacific	2.80	2.83:1	44	22	19	15
Variety *tropica* (Sewell, 1932)†	2.28	2.92:1	43	25	19	13

* Includes telescoped portion of abdominal segments of the specimens from Georges Bank and from the Pacific. Sewell's data used for *tropica*.

† Sewell apparently reversed the figures for the ratio of the anal segment and furca. Measurement of his figure of the abdomen shows that the length of the anal segment exceeds that of the furca.

recent paper, Fleminger and Bowman (1956) have reported that Wilson's determinations were incorrect and that *C. norvegica* was not present in any of the Carnegie and Albatross material in the U. S. National Museum. The only other mention of this species from the Pacific appears in Tanaka's (1953) list from the Izu region off southern Japan. Because no description or figures have been given of Pacific specimens and because of the apparent rarity of the species in that ocean, we are including a description based on two females and one male collected in the central North Pacific. These specimens were collected at 37° 43.9′ N., 165° 0.5′ W. ("Hugh M. Smith" cruise 25, sta. 13, Jan. 24, 1954, 200–0 m. depth of tow, 2 females and 1 male) and have been deposited in the U. S. National Museum (USNM 102741).

We have compared our specimens with Atlantic *C. norvegica* collected south of Georges Bank (northwest Atlantic) and loaned to us by the U. S. National Museum, with Sewell's description of *tropica,* and with Sars' (1903) redescription of *C. norvegica* based on specimens from the Norwegian Sea. Differences in the details of the lateral spines of the female genital segment were found. Sars implied in his description that these spines are simple and single pointed. Variety *tropica* Sewell is stated to have bifid spines on both sides. Our Pacific specimens agree with *tropica* in this respect, but the spines are somewhat smaller (Figs. 48, 49). The Georges Bank specimen examined by us has a slightly bifid tip on the left spine and a simple spine on the right (Fig. 64). Furthermore, Sars stated that the genital segment is perfectly symmetrical, but in the specimens from the Pacific (Fig. 47) and Georges Bank (Fig. 63) and in *tropica,* the left spine is larger than the right. We believe that the size and detail of these spines is variable and may be of little diagnostic value. Table 2 gives the total length, cephalothorax–abdomen ratio, and abdominal segment ratios of the specimen from Georges Bank, Pacific specimens, and Sewell's variety *tropica.*

The structure of the female fifth feet presents some variation among specimens from the Pacific and Georges Bank, Sewell's *tropica,* and Sars' description. Sewell stated that the fifth feet of *tropica* were unlike *norvegica* in that there are two rather than three "spines" on the outer margin of the distal segment, but Sars (1903) mentioned that this margin may have two or three small "denticles." Of our two Pacific specimens, one has two spinous processes on each foot (Fig. 54), and the other has two on one foot and three on the other (Fig. 55). The Georges Bank specimen has two outer spinous processes on each foot. It appears that this is a variable characteristic. In *tropica* the two terminal fingers of the fifth feet are equal, but in all others examined or described the length of the outer is about twice that of the inner finger.

Sars stated that the points on the corners of the fifth thoracic segment diverge in dorsal view, but in all other specimens and descriptions examined by us these points point straight caudad.

The male from the Pacific (Figs. 56–62) agrees closely with the Georges Bank specimen and with the description given by Sars. The total length of our specimen is 2.68 mm. and that of the Atlantic specimen is 3.23 mm.

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